

Operating Manual of the charger E6D

Microprocessor controlled high-performance rapid charger/discharger for NiCd/NiMH/Lithium/Pb batteries. Dual input power (50W/AC, 90W/DC), temperature sensor and integrated Lithium battery balancer



Charger current: 0.1-6 A
LiPo/LiFe/LiIo: 1 - 6 series
Pb(Lead-acid): 2 - 22 V

Discharger current: 0.1- 1 A
NiCd/NiMH: 1 - 15 cells

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1. Special features

Operating software

The operating program in this charger is executed with mutual links and communications with every component to prevent any possible error, so it introduces the maximum safety. Especially, the charging algorithm is so multifarious that you can select the best program to suit your requirement. And E6D has a large LCD for showing various information including charge/discharge graphs during the process.

Dual input power

E6D employs the circuit that can be operated at AC(Alternating Current) or DC(Direct Current) input power. For AC input, the charger contains a AC-DC switching power supplier inside, which has maximum output power of 50 watts for charging. But in DC input, the charger's maximum output power of 90W. The charger can charge up to 15 cells of NiCd/NiMH and 6 series of Lithium batteries. There may be the limit of feeding current to a higher voltage of battery by chargers wattage.

Maximum safety

Delta-peak sensitivity: The automatic charge termination program works on the principle of the Delta-peak voltage detection.(NiCd/NiMH)

Auto-charge current limit: When charging NiCd or NiMH at "AUTO" current mode, you can set the upper limit of charge current to avoid from feeding high current to the battery. This is very useful when charging the low impedance and small capacity NiMH battery in "AUTO" model.

Capacity limit: The charging capacity always calculated by multiple of the charging current and time. If the charging capacity exceeds the limit the process will be terminated automatically when you set the maximum value.

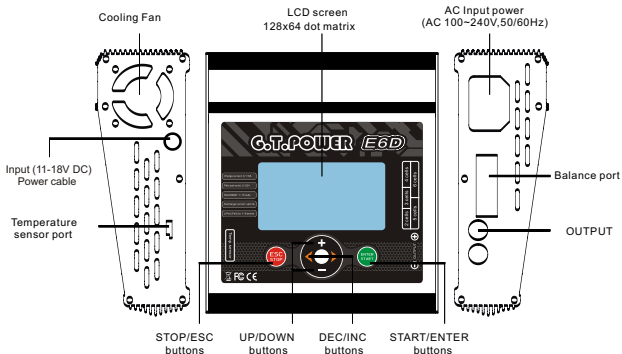
Temperature limit: The temperature of the battery on charging or discharging will be raised by its internal chemical reaction. If you set the limit of temperature the process will be expired forcibly when the limit has been reached.

Processing time limit: You can also restrain the maximum processing time to prevent any possible defect.

Cyclic charging /discharging for NiMH/NiCd battery

Perform 1 to 10 cycles of charge >discharge or discharge> charge continually for battery refreshing and balancing.

2. Exterior of the charger



- “up” and “Down” buttons

Navigate the cursor through the main menus vertically, and scroll the program set-up screen.

- “DEC” and “INC” buttons

Decrease or increase the parameter value or enter the program mode. And also, they navigate the cursor through the main menu horizontally.

- “START/ENTER” button

Commence the program by pressing this button at the program set-up screen. Confirms the message.

- “STOP/ESC” button

Suspend the program by pressing this button during the program is running. Deletes the error message. Returns to the previous screen.

- Temperature sensor port

Connect the temperature sensor to this port to monitor the battery temperature.

- Never leave the charge unsupervised when it is connected to its power supply. If any malfunction is observed, terminate the process immediately and refer to the operating instructions.

- Keep away the unit from dust, damp, rain, heat direct sunshine and vibration. Do not drop it.

3. Warnings and safety notes

- The circuit of the unit is designed to be powered by a 11-18V DC power supply, or 100-240V AC power selectively.
- The charger and the battery to charge or discharge should be set up on a head-resistant, non-inflammable and non-conductive surface. Never place them on a car seat, carpet or similar. Keep all the inflammable volatile materials well away from operating area.
- Be sure to understand the information of the battery to be charged or discharged accurately. If the program is set up incorrectly the battery can severely be damaged. Especially Lithium battery can cause a fire or an explosion by over-charging.

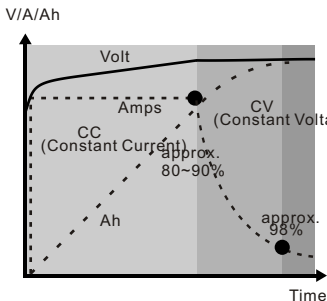
NiCd/NiMH	voltage level: 1.2V/cell allowable fast charge current: 1C-2C depends on the performance of cell discharge voltage cut off level: 0.85V/cell(NiCd), 1.0V/cell(NiMH)
Lilo	voltage level: 3.6V/cell max. charge voltage : 4.1V/cell allowable fast charge current: 1C or less min. discharge voltage cut off level: 2.5V/cell or higher
LiPo	voltage level: 3.7V/cell max. charge voltage: 4.2V/cell allowable fast charge current: 1C or less discharge voltage cut off level: 3.0 V/cell or higher
LiFe	voltage level: 3.3V/cell max. charge voltage: 3.6V/cell allowable fast charge current: 4C or less (e.g. A123M1) discharge voltage cut off level: 2.0 V/cell or higher
Pb(Lead-acid)	voltage level: 2.0V/cell max. charge voltage: 2.46V/cell allowable fast charge current: 0.4C or less Discharge voltage cut off level: 1.75 V/cell or higher

- To avoid short-circuits between the charge lead, always connect the charge cable on the unit first and only then to the battery to be charged or discharged. Reverse the sequence when disconnecting.

- Do not attempt to charge or discharge the following types of battery.
 Battery pack, which consists of different types of cell (including different manufacturers).
 Battery, which is already fully charged or just slightly discharged.
 Non-rechargeable batteries (Explosion hazard).
 Batteries that require a different charge technique from NiCd, NiMH, Lilo, LiPo, LiFe or Pb.
 Faulty or damaged battery.
 Battery fitted with an integral charge circuit or a protection circuit.
 Batteries installed in a device, or which are electrically linked to other components.
 Batteries that are not expressly stated by the manufacturer to be suitable for the currents
 The charger delivers during the charge process.
- Please bear in mind of checking the following point before charge operation.
 Did you select the appropriate program, which are suitable for the type of battery?
 Did you set up adequate current for charging or discharging?
 Lithium battery pack can be composed with parallel and series circuits mixed. You have to check the composition of the battery pack carefully before charging.
 Are all connections firm and safe, or is there an intermittent contact at any point in the circuit?

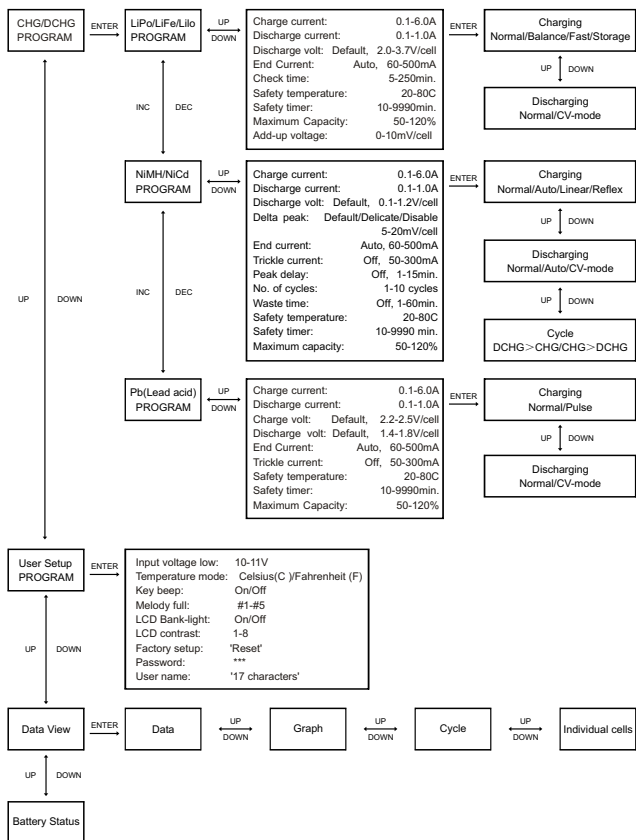
Those warnings and safety notes are particularly important. Please follow the instructions for a maximum safety; otherwise the charger and the battery can be damaged violently. And also it can cause a fire to injure a human body or to lose the property.

CC/CV charging process for Lixx and Pb(Lead-acid)

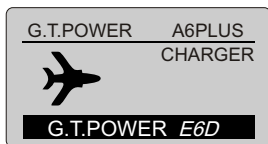


There batteries need to adopt different charge technique which is termed constant current(CC) and constant voltage(CV) method. As the process starts, the CC phase will be committed first, in which the charging current is maintained at a constant level until the battery reaches their final charge voltage. And then, the CV phase will be initiated, in which the voltage is maintained at a constant level. At this point the battery already has been charged about 80-90% full. The charging current will start to decrease until it reached its 1/10 of starting amount. When the charging current reached 1/10 of initial amount, the charger will stop the charging process. The battery is virtually fully charged at this point.

4. Program flow chart



5. The first display



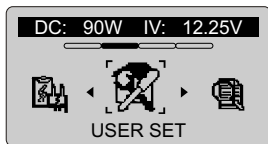
When you connect the crocodile clips which attached to the charger as a input power cable to a suitable 12V DC power source, or AC power cord to the wall socket, the start-up display appears. Thus the power- on process has been completed. The display shows the brand name and device name as well as user's name. The default display for user's name is "E6D", but you can revise it by your name at "SET UP" program.

Press "ENTER" to go for the main menu.

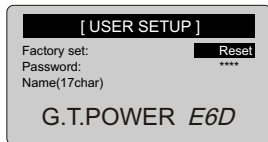
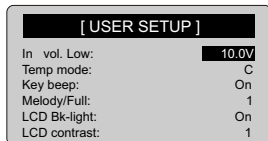
6. Initial parameter set up

E6D will be operated with the default values of the initial settings which were done at the factory, when it is connected to a 12V DC battery or any similar input power source for the first time. The user can set these values at his/her own requirement. These set up data will be commonly applied through all programs.

Select 'USER SET' program by pressing 'UP' or 'DOWN' button, then Press 'ENTER'.



START
ENTER



If you forgot the password, you cannot reset the charger to factory default, and also you cannot amend the user name again. The charger should be returned to our factory to revive the password.

- **In vol. low:** This program monitors the voltage of input battery. If the voltage drops below the value you set the operation forcibly terminated to protect the input battery.(DC input power only,10.0-18.0V DC)

- **Temp mode:** Choice of temperature mode. (C, Celsius or F, Fahrenheit)

- **Key beep:** The beep sounds at every time pressing the buttons to confirm your action.

- **Melody/Full:** Select the melody sounds at the time when the process is finished. These audible sounds can be on or off.

- **LCD BK-Light:** LCD back-light can be on and off.

- **LCDD contrast:** You can adjust the brightness of LCD screen, when 'LCD Light' is on.

- **Factory setup:** Restore all values to the default which was done at our factory. To do this, you need to enter the password. The way of entering the password is described on 'Password' mode at next step. When you perform this program successfully, all the data will return to their default values including the password('0000'). It will take several seconds to initialize the data.

- **Password:** You can set your own 4-digit password. It has been set on '0000'-all zeros, at the factory. Or, you can change the password to new one. The password can be any combination of 4-digits within those alphanumeric characters. Locate the black mark to the desired character by pressing 'INC' or 'DEC' button then press 'DOWN' button for next digit input. For going back the digit, press 'up' button. First, input old password, then type new password.

- **Name:** The charger shows the user name at the first screen at power-on. You can set your name of maximum 17 alpha-numeric characters. When you enter the mode, the charger will ask you the password. You need to input the password to change the name. The user name can be entered using exactly the same procedure as described on 'Password' program.

[USER SETUP]

Factory set: Reset

Password: [****]

Name(17 char)

G.T.POWER E6D

START
ENTER

[USER SETUP]

Password: [****]

A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P				
Q	R	S	T						

START
ENTER

[USER SETUP]

Password: [****]

A	B	C	D	E	F	G	H	I	J
---	---	---	---	---	---	---	---	---	---

Reset all data?

Confirm(ENTER)

[USER SETUP]

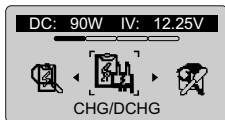
Old word: [****]

A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z	1	2	3	4
5	6	7	8	9	0				

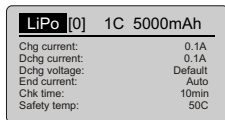
[USER SETUP]

G.T.POWER E6D

A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z	1	2	3	4
5	6	7	8	9	0				

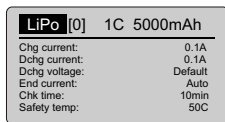
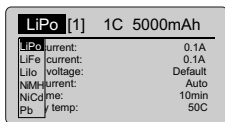
7. Lithium battery (Lilo/LiPo/LiFe) program

START
ENTER



These programs are only suitable for charging and discharging Lithium batteries with a nominal voltage of 3.3V, 3.6V or 3.7V per cell. These batteries need to adopt different charge technique is termed constant voltage (CV) and constant current(CC) method. The charge current varies according to the battery capacity and performance.

Select 'CHG/DCHG' program at main menu by pressing 'UP' or 'DOWN' button, and press 'ENTER' to go for the program.

7.1 Parameter set-up for Lithium battery(LiLo/LiPo/LiFe)

You can choose the type of battery to be charged or discharged at the first section. Select LiPo, LiFe or Lilo according to your battery. And then, select the number already set up for re-use. If you have the set-up data which had been performed successfully before, you can just start the process after loading the data number. All set up data will be stored at charger's memory automatically after setting them all. Input the cell-count and capacity of the battery will be charged at the top line of menu. The cell-count and capacity need to be matched with the battery.

Use 'UP' or 'DOWN' button to scroll up and down the menu, and change the value by using 'INC' or 'DEC' button. To start the process, press and hold 'ENTER' button for more than 3 seconds regardless of cursor position.

-Chg current: Set the charge current. (0.1A-6.0A)

-Dchg current: Set the discharge current. The value may not exceed 1C for a maximum safety. (0.1-1.0A)

-Dchg voltage: Set the final voltage per cell at the end of discharge. The final voltage should not be under the voltage level that is recommended by the battery manufacturer to avoid deep discharging. The default values are 3.00V/cell(LiPo/Lilo) and 2.00V/cell(LiFe).

- **End current:** Set the final charging current at termination. The end current should be less than the initial charge current. (Auto, 60-500mA)

Auto : The process will be terminated when the charging current go to 1/10 of its initial value. Otherwise the charge current will be decreased until the designated value has been reached.

- **Chk time:** E6D recognizes the cell-count of Lithium battery automatically. But the battery which has been discharged deeply can be perceived the cell-count incorrectly. The charger will work on the cell-count anyway during the check time. But if the charger finds the wrong cell-count at the end of check time, the process will be terminated with an error message. Normally, 10 minutes are enough to perceive the cell-count correctly. For the battery of larger capacity, you may extend the time term. (5-250min)

- **CV Hold:** The charger will try to keep the final voltage of battery after finishing charge process, if this sets 'ON'. When you let the battery remain connecting to charger, the charger will keep working on charging with very small feeding current and the voltage never drop below the final charge voltage. The balance job also will be kept on, if the balance plug is connected. How long the battery remains in connection to charger, the job will last until the battery is pulled out from charge leads (ON/OFF)

Safety programs for all types of battery

- **Safety temp:** This is a feature using temperature probe contacting the surface of battery, which can monitor the temperature of battery. The recommended maximum temperatures are 45-55C(113-130F) for NiCd, 43-52C (110-125F) for NiMH and 32-35C (90-95F) for Lithium. Once the battery reaches this temperature during the process, the program will be terminated forcibly to protect the battery. If the battery reaches the temperature during discharge, the discharge process will temporarily pause to allow the battery to cool down to a safe temperature. Then ,discharge process will automatically resume when the battery's temperature drops about 4℃ below the battery to reach during charge or discharge process. (20-80C)

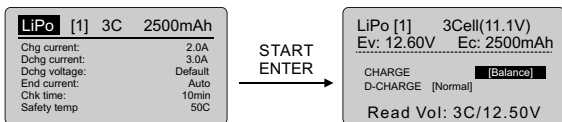
- **Safety timer:** When you start a charge process , the integral safety timer automatic starts counting. This is programmed to prevent over-charging or deep-discharging the battery, when the charger or battery is proved to be fault, or the termination circuit cannot detect the end of process. The value for the safety timer should be generous enough to allow the full-charging.(10-1380min)

- **Max capacity:** You can define the maximum capacity which can be charged or discharged by the form of a percentage of battery capacity set in the top of display. If full-charge has not been detected for any reason, the charger limits the quantity of feeding energy by the value and terminates the process as on the value is reached. This is safety feature programmed to protect the battery from over-charging or deep-discharging condition.(50-120%)

7.2 Select program and start the process

After setting up all parameter, press and hold 'ENTER' button for more than three seconds to go for the next step. The display will show you the choice of options which are charge or discharge.

Press 'UP' or 'DOWN' button to select 'Charge' or 'Discharge', and press 'INC' or 'DEC' button to choose a sub-program to be performed. To start the process, locate the cursor at the sub-program to be performed then press and hold 'ENTER' button for three seconds.



- **Charge 'Balance':** This is for balancing the voltages of each individual cell of battery pack to be charged. To do this, the battery pack being charged should have the individual cell connector. And connect it to the individual port at the right side of charger with a suitable connection adaptor that fits with your battery. And also, you should to connect the battery ordinary charging mode. The internal processor of the charger will monitor the voltages of each cell of the battery pack and controls the charging current that is feeding to each cell to normalize the voltage.

- **Charge 'Storage':** This is for Lithium battery not to be used for long time. The program will determine to charge or discharge the battery to a certain voltage depending on the voltage of the battery at its initial stage. The final voltages are different from type of batteries, 3.6V for Lilo. 3.7V for LiPo and 3.3V for LiFe per cell. If the voltage of battery at its initial stage is over the voltage level to storage, the program will start to discharge.

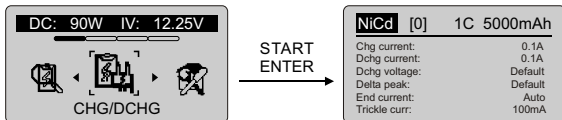
- **Charge 'Fast':** The charging current is getting smaller as the process goes to the near end term of Lithium battery charging. To finish charging process earlier, this program eliminate certain term of CV process. Actually, the charging current will goes to 1/5 from the initial value to end the process while the normal charging goes to 1/10 during CV term. The charging capacity may be a bit smaller than normal charging but the charging time will be reduced.

- **Discharge 'Normal':** The charger will keep on discharging with the discharge current continuously until the discharge voltage has been reached.

- **Discharger 'CV-mode':** The discharging current will be decreased gradually until the end current which has been set up at 'End current' has been reached, when the voltage has been dropped to the final discharge voltage. For maximum discharge, use this mode.

It is very important to know the exact type of battery to be charged, nominal voltage and capacity. Not to know these facts is the reason why batteries are damaged and improperly cared for. Read the batter's label and instruction sheet carefully, or consult the battery supplier to get those facts.

8. NiMH/NiCd battery program



These programs are for charging, discharging or cycle NiMH (Nickel-Metal-Hydrde) or NiCd (Nickel-Cadmium) battery commonly used for R/C model applications. The charge current varies according to the battery capacity and performance. The type of battery which is either NiMH or NiCd must be correct for the battery being charged.

Select 'CHG/DCHG' program at main menu by pressing 'UP' or 'DOWN' button, and press 'ENTER' to go for the program.

8.1 Parameter set-up for NiCd/NiMH battery

NiCd [0] 1C 5000mAh	
LiPo current:	0.1A
LiFe current:	0.1A
Lilo voltage:	Default
NiMH peak:	Default
NiCd current:	Auto
Pb curr:	100mA

NiCd [0] 1C 5000mAh	
Chg current:	0.1A
Dchg current:	0.1A
Dchg voltage:	Default
Delta peak:	Default
End current:	Auto
Trickle curr:	100mA

You can choose the type of battery to be charged or discharged at the first section. Select NiCd or NiMH according to your battery. And then, select the data number which will newly set up, or load the data set-up data which had been performed successfully before, you can just start the process after loading the data number. All setup data will be stored at charger's memory automatically after setting them all. Input the cell-count and capacity of the battery will be charged at the top line of menu. The cell-count and capacity need to be matched with the battery.

Use 'UP' or 'DOWN' button to scroll up and down the menu, and change the value by using 'INC' or 'DEC' button. To start the process, press and hold 'ENTER' button for more than 3 seconds regardless of cursor position.

- **Chg current:** Set the charge current. (0.1-6.0A)
- **Dchg current:** Set the discharge current. The value may not exceed 1C for a maximum safety. (0.1-1.0A)
- **Dchg voltage:** Set the final voltage which the battery will reach at the end of discharge. The default value is 0.90V/cell. (0.1-1.2V/cell)

- **Delta-peak (Delta-peak voltage sensitivity):** Set the Delta-peak voltage sensitivity at termination. (Disable, Delicate, Default, 5-20mV/cell)

Disable: The charger would not detect Delta-peak voltage for termination. To terminate charging process, the charger will check the parameters set up at other safety parameters like max. capacity, safety timer or safety temperature. If anyone has been reached at its limit, the charging process will be terminated.(for NiMH only)

Delicate: The charger will detect a very small variation at delta-peak voltage. Some NiMH batteries which shows small voltage-drop at peak need to be use this option.

Default: If you do not know much about this function, or for ordinary batteries, select this mode. 15mV/cell for NiCd or 10mV/cell for NiMH will be used.

- **End current:** Set the final charging current at termination. The end current should be less than the initial charge current. (Auto, 60-500mA)

Auto: The process will be terminated when the charging current go to 1/10 of its initial value. Otherwise ,the charge current will be decreased until the designated value has been reached.

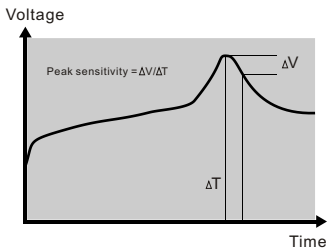
- **Trickle curr:** Activate or deactivate the trickle charge after the termination of process.(Off, 50-300mA)

- **Peak delay:** This restrains the delta-peak voltage detection until the time has reached. This prevents a premature cut-off from the battery of high internal resistance. The default value is one minute.(1-15 minutes)

- **No. cycles:** The number of cycles in the process. (1-10 times)

- **Waste time:** To avoid the battery from rising temperature caused by the internal chemical reactions. There should be a brief cool-off time between cycles.(0-60 minutes)

Delta-peak voltage for NiCd and NiMH batteries

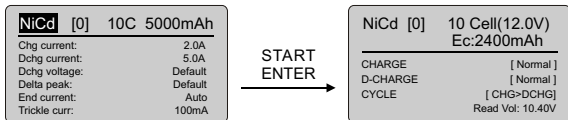


The most distinctive point on the voltage curve of a charging battery in response to a constant current is the voltage peak that occurs as the cell approaches full charge. The voltage will slightly drops after its maximum point. The charger works with proven 'Delta-peak voltage termination' to terminate charge process for NiCd and NiMH batteries. The actual termination point depends on the charging characteristics of the particular battery. Please refer the specification which is provided by the battery manufacturer.

8.2 Select program and start the process

After setting up all parameters, press and hold 'ENTER' button for more than three seconds to go for the next step. The display will show you the choice of options which are charge, discharge and cycle.

Press 'UP' or 'DOWN' button to select 'Charge', 'Discharge' or 'CYCLE', then chose a sub-program to be performed using 'INC' or 'DEC' button. To start the process, locate the cursor at the sub-program to be performed then press and hold 'START/ENTER' button for three seconds.



- **Charge mode:** Set the charge mode which the charger will work with.

Normal: The charger will work with the parameters which were set at the screen. The feeding current will be zero at every 90 seconds to have 6 seconds of waster-time for higher charging efficiency.

Auto: The optimum charge current will be set by the charger automatically. The charge current set at 'Chg current' will be upper limit of charge current.

Linear: The charging current will be fed continuously without hesitating. The battery is charged with pure 'Direct-Current'.

- **Discharge mode:** Set the discharge model which the charger will work with, on discharging.

Normal: The charger will finish discharging at the time when the voltage drops to the final voltage set at 'Dchg voltage'.

Auto: The charger will discharge the battery until the voltage drops to 0.90V per cell.

CV-mode: When the voltage has been dropped to the final discharge voltage, the discharger job will continue until the end current which has been set at 'End current' has been reached with decreasing discharge current gradually. For maximum discharge, use this mode.

- **Cycle mode:** You can use this function for balancing, refreshing and break-in the battery. All of charging and discharging parameters will be adopted from the values of 'CHARGE' and 'DISCHARGE' programs. Select the sequence of performing program.

CHG>DCHG: The charger starts with charging process, then the battery will be discharged.

DCHG>CHG: It starts with discharging process, then the battery will be charged.

Cautions for NiMH batteries

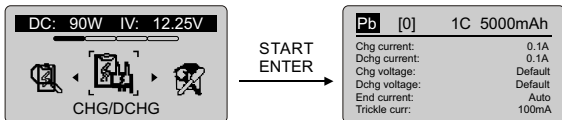
-Do not allow NiMH batteries to over-heat. Using the battery cooler will prevent over-heating at charge and discharge.

-Small size batteries like 'AAA','AA' and 'A' can safely be full charged at currents up to 1.0C.Higher charge current can easily over-heat batteries and thus damage batteries.

-NiMH batteries have higher self-discharge rate compare to NiCd, so it is necessary to recharge the battery immediately prior to use.

-Store NiMH batteries with some voltages remaining.

9. Pb (Lead-acid) battery program



This is programmed for charging Pb(lead-acid) battery with nominal voltage from 2 to 22V Pb batteries are totally different from NiCd or NiMH batteries, but very similar with Lithium batteries. They can only deliver relatively lower current compare to their capacity, and similar restrictions apply to charge. So the optimal charge current will be 1/10 of the capacity, and Pb batteries must not be charged rapidly. Always follow the instruction which was supplied by the battery manufacturer.

Select 'CHG/DCHG' program at main menu by pressing 'UP' or 'DOWN' button, and press 'ENTER' to go for the program.

9.1 Parameter set-up for Pb battery

Pb	[0]	1C 5000mAh
LiPo	current:	0.1A
LiFe	current:	0.1A
LiIo	voltage:	Default
NiMH	peak:	Default
NiCd	current:	Auto
Pb	curr:	100mA

Pb	[0]	1C 5000mAh
Chg	current:	0.1A
Dchg	current:	0.1A
Chg	voltage:	Default
Dchg	voltage:	Default
End	current:	Auto
Trickle	curr:	100mA

Select 'Pb', then select the data number which will newly set up, or load the data number already set up for re-uses. If you have the set-up data which had been performed successfully before, you can just start the process after loading the data number. All set up data will be stored at charger's memory automatically after setting them all.

Input the cell-count and capacity of the battery will be charged at the top line of menu. The cell-count and capacity need to be matched with the battery.

Use 'UP' or 'DOWN' button to scroll up and down the menu, and change the value by using 'INC' or 'DEC' button. To start the process, press and hold 'ENTER' button for more than 3 seconds regardless of cursor position.

- **Chg current:** Set the charge current.(0.1-6.0A)
- **Dchg current:** Set the discharge current. The value may not exceed 1C for maximum safety.(0.1-1.0A)
- **Chg voltage:** Set the final charge voltage per cell. The charger will charge the battery until the voltage has been reached. The default values is 2.45V/cell. (2.20-2.50V/cell)
- **Dchg voltage:** Set the final voltage which the battery will reach at the end of discharge. The default value is 1.5V/cell. (1.4-1.8V/cell)

- **End current:** Set the final charging current at termination. The end current should be less than the initial charge current . (Auto ,60~500mA)

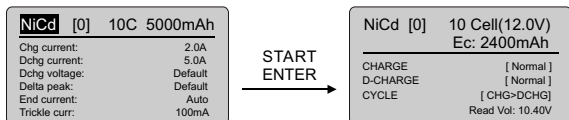
Auto: The process will be terminated when the charging current go to 1/10 of its initial value. Otherwise, the charge current will be decreased until the designated value has been reached.

- **Trickle curr:** Activate or deactivate the trickle charge after the termination of process(Off,50~300mA)

9.2 Select program and start the process

After setting up all parameters, press and hold 'ENTER' button for more than three seconds to go for the next step. The display will show you the choice of options which are charge, discharge and cycle.

Press 'UP' or 'DOWN' button to select 'Charge' or 'Discharge' program, then chose a sub-program to be performed using 'INC' or 'DEC' button. To start the process, locate the cursor at the sub-program to be performed then press and hold 'START/ENTER' button for three seconds.



- **Charge mode:** Set the charge mode which the charger will work with.

Normal: The charger will work with the parameters which were set at the screen. The feeding current will be zero at every 90 seconds to have 6 seconds of waste-time for higher charging efficiency.

Pulse: The charger will work with the parameters which were set at the screen. The feeding current will be zero at every 30 seconds to have 3 seconds of waste-time for higher charging efficiency.

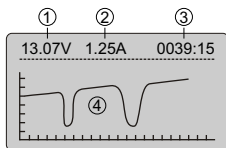
- **Discharge mode :** Set the discharge mode which the charger will work with, on discharging

Normal: the charger will stop discharging at the time when the voltage drops to the final voltage set at next parameter-'Dchg volt'.

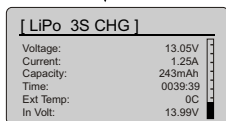
CV-mode: The discharging current will start to be decreased gradually until the end current which will be set up at next has been reached, when the voltage has been dropped to the final discharge voltage. For maximum discharge ,use this mode.

10. Screen displays during process

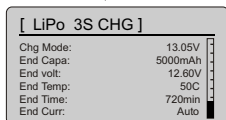
As the program starts by pressing 'START/ENTER' burron, the LCD will be changed to show the charge or discharge graph, and also some other data. Those displays can be switched using 'UP' or 'DOWN' button. The display will go back to the graph screen automatically, after showing the data screen in three minutes.



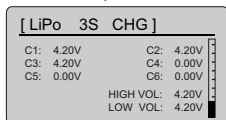
UP ↓ DOWN



UP ↓ DOWN



UP ↓ DOWN



(1) The voltage of battery is being processed, which will be updated as the process goes on in real time.

(2) The feeding current at real time.

(3) Elapsed time after the process started.

(4) The graph shows the voltage curves in Y-axis along with the time in X-axis. The graph will automatically be scaled to fit in the screen

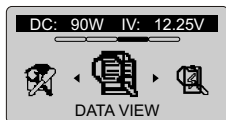
Ext temp: The temperature of battery is being process in real time. The temperature sensor should contact the surface of battery firmly to read out the data accurately.

In volt: The voltage of battery or DC power source, which is being used as an input power supply for the charger.

The other values show the data you already done at the program set-up to verify what you have done.

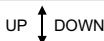
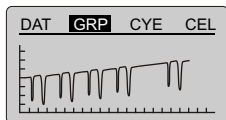
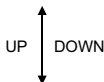
Individual cell voltages: The display shows the voltage of individual cells during charging Lixx battery. To show the voltages, the balance adaptor should be linked to the balance port of charger with connecting the balance tab of battery pack.

11. Review the date after finishing the progress

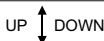


After finishing the program, you can review the date which had been pertained to the input and output of the charger by selecting 'DATE VIEW' menu at the main screen. These date cannot be shown while the program is being on progress.

DAT	GRP	CYE	CEL
Input vol:		12.35V	
Battery vol:		10.54V	
Ext temp:		42C	
Chg time:		52min	
Dchg time:		0min	
Capacity:		898mAh	



DAT	GRP	CYE	CEL
No	Capacity	Voltage	
1	C	0000mAh	0.00V
	D	0000mAh	0.00V
2	C	0000mAh	0.00V
	D	0000mAh	0.00V



DAT	GRP	CYE	CEL
C1:	4.20V	C2:	4.20V
C3:	4.20V	C4:	0.00V
C5:	0.00V	C6:	0.00V
	HIGH VOL:	4.20V	
	LOW VOL:	4.20V	

Input vol: DC voltage at the charger's input lead.

Battery vol: DC voltage of battery at the end of process.

Ext temp: The temperature of battery as measured with temperature sensor connected to temperature sensor port of charger at the end of process.

Dhg time: The total elapsed of time needed to complete the charge progress.

Dchg time: The total amount of time needed to complete the discharge progress.

Capacity: The total amount of charged or discharged capacity during whole process.

The graph shows the voltage curves in Y-axis along with the time in X-axis, after the process has finished.

The display shows the battery's capacity and peak voltage reading for each charge and discharge period for up to 10 cycles. The cycle number is show on the left side of the display. Pressing 'INC' or 'DEC' button will scroll the display up and down. Charge data is marked by 'C' and discharge data is marked by 'D'.

The display shows the final voltage of individual cells, when the balance tab was connected to the individual port of charger during the progress of Lixx battery.

12. Warning and error messages

E6D incorporates a various functions of protective and monitoring the system to verify functions and the state of its electronics. In any case of occurring error, the screen displays the cause of error that is self-explanatory with audible sound.

Check connection ---
Reversed polarity

STOP/ESC

The output is connected to a battery with incorrect polarity.

Check connection ---
Connection break

STOP/ESC

This will be displayed in case of detecting an interruption of the connection between battery and output or voluntarily disconnecting the charge lead during the operation.

Check cell-count ---
Incorrect cell-count

STOP/ESC

The cell-count of Lithium battery pack was selected incorrectly. Verify the cell-count carefully.

Check charger ---
Break-down

STOP/ESC

There happens the malfunction at the charger circuit by any reason. The charger should be repaired at the factory.

Check connection ---
Short-circuit

STOP/ESC

There is a short-circuit at output. Please check the charging leads or output cable of battery pack.

Check battery ---
Low voltage

STOP/ESC

The charger detects the voltage is lower than you set at Lithium program. Please check the cell-count of the battery pack.

Check battery ---
High voltage

STOP/ESC

The charge detects the voltage is higher than you set at Lithium program. Please check the cell-count of the battery pack.

Check balancer ---
Comm. Error

STOP/ESC

The balancing circuit had been damaged. The balance function can not be used, and the charger needs to be repaired at our factory.

Balance error ---
Low cell vol.

STOP/ESC

The voltage of one of the cell in the Lithium battery pack is too low. Please check the voltage of cells one by one.

Balance error ---
High cell vol.

STOP/ESC

The voltage of one of the cell in the Lithium battery pack is too high. Please check the voltage of cells one by one.

Balance error ---
Bad connection

STOP/ESC

There are bad connection at the individual connector. Please check the connector and cables carefully.

Balance error ---
Ref. Data fail

STOP/ESC

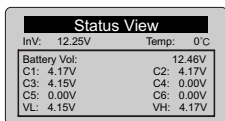
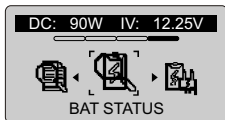
The charger cannot read out the individual voltage correctly because of malfunction of main processor. The charger needs to be repaired.

Check power ---
Low input volt

STOP/ESC

The voltage of input power drops below the limit.

13. Battery status view



You can check the battery status simply by connecting it to charger. After connecting the battery to charger, select 'BAT STATUS' program at main menu. You can see the data which has been read from the output of charger.

Input vol: DC voltage at the charger's input lead.

Temp: The temperature is read out from the temperature sensor. If it is not linked, the value will be zero.

Battery vol: The output voltage of battery.

C1-C6: The individual voltage of battery pack. The balance tab should be connected to the balance port of charger.

14. Glossary of terms

Amps(A): The unit of measuring for charge or discharge electric current. The program of the charger will be show the current in amp(A) at its display.

Milliampere (mA): The electric current, being amps(A) multiplied by 1000 and noted as 'mA'. So 2.0A is the same as 2000mA (2.0×1000). Or, to convert mA to amps, divide the mA number by 1000. If a current value is below 1.0A, the display of charger will still show the current in amps, not milliampere. For example, a current of 600mA will be displayed as 0.6A.

Capacity, milliampere hours (mAh), and amp-hour (Ah): Charge energy stored by a battery is called capacity, which is defined as how much current a battery can supply constantly over one hour of time. Most hobby batteries are rated for capacity in 'Ah' or milliampere hours. A 650mA battery can delivery 650mA of current for one hour ($650A \times 1hr = 60Ah$).

Nominal voltage (V): The nominal voltage of the battery pack can be determined as follows;

- NiCd or NiMH: multiply the total number of cells in the pack by 1.2A 8-cell pack will have a nominal voltage of 9.6 volts (8×1.2).
- LiPo: multiply the total number of cells in the pack by 3.7A 3-cell LiPo wired in series will have a nominal voltage of 11.1 volts (3×3.7).
- Lilo: multiply the total number of cells in the pack by 3.6.
- LiFe: multiply the total number of cells in the pack by 3.3.

If the nominal voltage of battery is not printed on the battery's label, consult your battery manufacture or supplier. Do not guess the rated voltage of battery.

'C'-rating: Capacity is also referred to as the 'C' rating. Some battery suppliers recommend charge and discharge current based on the battery 'C' rating. A battery's '1C' current is the same number as the battery's rated capacity number, but noted in mA or amps. A 600mAh batter has a 1Ccurrent value of 600mA or 0.6A.

15. Specifications

Operating voltage range:	11.0-18.0V DC AC 100-240V(50/60Hz)
Circuit power:	Charge max.90W at DC input max.50W at AC input Discharge max.5W at AC/DC input
Charge current:	0.1-6.0A
Discharge current:	0.1-1.0A
NiCd/NiMH battery cell count:	1-15 cells
Lithium battery cell count:	1-6 series
Pb battery voltage:	2-22V
Battery data memory:	10 memories per program
Battery capacity range:	100-65000mAh
Delta-peak sensitivity:	Disable/Delicate/5-20mV adjustable
Temperature cut-off range:	20-80C/68-176F
Trickle charge current:	Off, 50-300mA adjustable (N/A for Lixx)
Cycle count:	1-10times (N/A for Lixx)
Weight:	750g
Dimensions:	155x140x60mm

16. Warranty and service

We warrant this product for a period of one year (12 months) from the date of purchase. The guarantee applies only to such material or operational defects, which are present at the time of purchasing the product. During that period, we will repair or replace without service charge any product deemed defective due to those causes. Any repairs carried out under warranty do not extend the original warranty period. You will be required to present proof of purchase (invoice or receipt). The defective unit has to be sent to us by pre-paid delivery; we will pay for return shipping cost. This warranty does not cover the damage due to wear, overloading, incompetent handling or using of incorrect accessories.